

L. P. Schultz

1947 Notes

RECORD

Record of the
Bikini Resurvey 1947
Notes by Leonard P. Schults
while attached to the
V. S. S. Chilton (APA-38)

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July 7, 1947

Civilian-U.S. Navy Cooperation.

This expedition was entered into by me with some skepticism as to the possibility of cooperation between the Navy - and civilian scientists, after my experience last year on the Bowditch. However within 20 min. after arrival on the Clulton I was assigned a room and was settled comfortably within an hour. I immediately sought inform. on arrival of our equipment and by evening, (I reported on board at 8 PM) was informed all gear of the USN M was stowed away on the decks by the bio. lab.

On the Bowditch it was, ^{about} 20 days before I had a room and we slept in the chartroom.

Every man on the Clulton officer and crew were courteous. The Captain, Lo Jennesse, the Commodore Hederman and Capt. Engleman, project officer, were there to serve the scientists.

The Wardroom mess boys in charge was efficient, neatly dressed, and the steward and every boy was there to serve.

over

It was the reversal of 1946 in every detail. The Navy must have profited from the 1946 experience and made this an experiment in cooperation.

On July 16th we left for a field trip for 3 days but upon departure the ship was not equipped for civilian camping as it should have been. This was not the fault of the ship's officers but the lack of planning back in Washington. The scientists who go on trips should be consulted personally and not their bosses. In that way plans can be drawn up and the following items would not have been lacking. ~~the~~ cots, mess kits, water containers, ample rations.

The important thing in such a long, big trip as this is more than giving several weeks before we get ~~the~~ orders to go and not just two weeks notice. We did not lack any needed scientific gear only camping facilities.



BIKINI RESURVEY PROJECT
DIRECTORY OF OFFICERS
NAVY

<u>Rank</u>	<u>Name</u>	<u>Primary Duty</u>	<u>Collat. Duty</u>	<u>Quarters</u>
Captain	T. H. HEDERMAN	Task Group Com.		FlagQtr.
Captain	C. L. ENGLEMAN	Project Officer		FlagPlot
Commander	E. S. GILFILLAN, jr.	Technical Director		106
Commander	R. S. BROOKINGS	Administrative Off.	Secur. Off.	ChStfSR
Commander	H. S. ETTER (MC)	Radiological Health		0107
Lt. Comdr.	W. R. RICHARDSON	Public Information Off.		Sta fBR
Lt. Comdr.	R. L. REASER	Deputy Tech. Director	Division Officer	Sta fBR
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Lieut.	R. W. GIVENS	Reports Officer	Communications Officer	Sta fBR
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Lt(jg)	A. (n) HEATH	Photographic Officer		101
Lt(jg)	B. D. LAMAR	Radiological Safety Officer.	Jr. Division Officer	101
Ensign	F. J. JABLONSKI	Aide to Project Off.		111
Ensign	C. A. SUEUR	Radiological Safety Officer.	Jr. Division Officer	TOQ
Ensign	J. T. WATSON	Radiological Safety Officer.	Jr. Division Officer	TOQ
Ensign	B. W. TIMMER	Ass't. to Technical Director		TOQ
Ensign	W. (n) NIVISON	Radiological Safety Officer.	Jr. Division Officer	TOQ
Ensign	W. E. GLENN	Electronics for Radiological Instruments.		111

ARMY

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Lt. Colonel	C. E. GRANT	Radiological Safety Officer		0109
1st Lieut.	E. G. HALLIGAN	Radiological Safety Officer.	Jr. Division Officer	101
2nd Lieut.	C. B. MACKENZIE	Radiological Safety Officer.	Jr. Division Officer	JrOffBR

John R. Smith

1861

1861

1861

1861

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July 14, 1946

All the way from Pearl Harbor, after 20300 miles out no pinkfinned flying fish were seen on way to Bikini. The only species was a 6 or 7 inch, clear pectoral finned black based forward, black lateral band on back, not certain.

This appeared to be a 4 winged form, probably an Exocoetus. No timing of flights was attempted.

about 400 miles east of Oahu
following records made: July 5, 1947

species	time of flight	# tapes
Clear finned, blackish	4	1
pectorals forward	1	1
and basally	7	2
"	1	1
"	4	1
"	4	1
Pinkish pectorals	10	4
" "	14	1
" "	8	1

The Clearfinned species has a much shorter flight, schools are large consisting of a few to as many as 50. The pink species ~~go~~ are alone or only a few, and they are

layer.

a year later in 1947

The 4th and 5th atomic bombs ^{were} ~~have~~ exploded at Bikini. Yet the palms are still waving in the tropical breeze, the pandanus is fruiting, ^{the} papaya have sprung from seeds left by the retreating boards of men, a lone dog still wanders on Bikini Island, and the little brown ~~Polynesian~~ rat is still abundant. Birds fly over head, ^{acacia crows on Eniwetok} and fishes still swim in the lagoon in nearly their same abundance. Yet one should not feel a ~~sense~~ a false sense of security because the atomic weapon is terrible indeed.

The concussion from the Baker Day blast ^{was} so great that the powerful forces could lift an entire battleship into the air, also caused great mortality in the fish populations in the immediate vicinity, so that hundreds of dead fish were found floating in the lagoon waters. Shortly after and for a few more days others appeared at the surface.

Great quantities of oil were released from the stricken ships and as this flowed out over the reef, smearing the corals and algae, the ~~reef~~ looked sick and the shellfish and echinoderms, great mortality occurred. Yet the overall picture of reef life has changed little because down below this surface layer ~~the~~ other individuals have come out to repopulate the area. Although the corals remain dead in ^{a few restricted} places, nature has begun the repopulation cycle, and new coral colonies are starting.

Bikini lagoon has had its ecology greatly disturbed, not only through the atom bomb blast but by the presence of a great armada of ships and nearly 45,000 men, dumping garbage and debris into the lagoon waters. ~~But~~ This, along with the blasting of coral heads in preparation for the great anchorage, has helped increase the turbidity of the water, ^{and the settling over of suspended solids} upon my arrival at Bikini in March 1946 of

could see coral heads ~~and~~ at a depth of 120 feet at midday but in July 1947 the water was less clear and coral heads are scarcely visible at depths of 35 ~~and 40~~ feet ^{off Bikini although they may be seen on the south side twice at depth} of the submerged and exposed reefs occur recent growths of a ~~fine~~ ^{undamaged} filamentous algal. Other reefs away from the ~~o~~ appear unchanged and the fauna and flora appear normal.

Yet, the ~~great~~ mystery of the biological changes induced by radiation are little known in this great ^{natural} laboratory. They are difficult to measure and the time is too short, yet ~~to~~ ^{obvious changes that may occur in the animals} undoubtedly radiation of alpha, beta and gamma rays will be emitted for years to come and how these will effect the somatic and genetic cells of the organisms at Bikini is not fully known. However in all animal organisms some effect will result, there will be sterilization of the sex

cells, red blood cells will be destroyed, and possibly mutations will occur. But any ~~the~~ organisms that tumors and cancers may form

Change morphologically to any extent or are weakened by the fission products, have little change of survival in the ~~best~~ competition that exists in tropical seas and on coral reefs. These weakened or unfit animals soon form part of the food chain in the ~~the~~ intense struggle of existence. Although countless ^{animal} individuals have perished, and still others may perish, the total fauna of Bikini has and will change little because after all, the destruction amounts to only a small percentage of the total, and the pressure of population from all sides into the damaged areas soon replaces the losses. Thus, ~~Bikini with~~ the fauna at Bikini will reach a gradual saturation or equilibrium again after many years, somewhat similar

expressive wave action
 currents, and deep water. The ~~best~~
 of habitats in which cube ~~was~~ root
 with a rotenone content ^{powdered} of about 5%
 were used as ^{where there is little mitigation for fishes or in} follows
 in sandy areas ^{abundant growths} or in ~~abundant~~ areas
 where the corals and algae form
 beautifully colored marine gardens,
 in depths of water up to 6 feet and
 some pools 10 feet deep, ~~the~~ with a
 slow current of not more than 10 feet
 a minute, a cloud of rotenone 50 feet
 wide and 100 feet long is mixed into
 the sea water at the lowest stage
 of the lowest tides.

About 35 minutes before the tide reaches
 the low point, ^{the} powdered root is mixed
 with sea water to a chocolate malted
 milk consistency. It takes about 20
 minutes for one man to mix 25 to 35
 lb. the usual quantity used in these
 open water stations. Mixing is
 done in buckets filled $\frac{2}{3}$ full of the
 powder. All of the mixture should be
 ready at the moment it is intended
 to be distributed. If the current moves
 about 5 feet per minute the cloud
 can be extended to 150 feet and
 35 feet wide. The mixture is
 then thrown into the water to form
 an evenly distributed cloud, brownish

in color. As the cloud passes over the corals
 fish begin to appear within five minutes.
 This cloud may travel for a 1000 to 2000
 feet, first killing all the fishes there
 as it gradually dilutes, only causing
 others to become sick. The fishes are
 driven from their hiding places ~~or~~
 by lack of sufficient oxygen as does
 they appear, men equipped with
 face masks and dip nets, pick them
 up singly or a few small ones
 at a time. A dipnet, 15 inches in
 diameter with a 2 foot long bag made
 of fine meshed bobbinet netting is the
 most satisfactory. It will retain
 the small eels if there are 14 to 16
 meshes per inch. This net should have
 a 7 foot long wooden handle, about $\frac{3}{4}$ inch
 to an inch in diameter.

In picking up the fishes a face
 mask is needed, worn over eyes and
 nose. This permits one to see perfectly
 under water. ~~The~~ When skin diving
 for the sick and dead fishes which
 first float, then sink to the bottom
 where they must be recovered by
 picking them up. The tiny fishes
 only 10 to 25 mm. long, lying
 on the bottom, are best recovered
 by creating a little current with the

hand or foot, that lifts them up a few inches, where they can be scooped up without getting sand and gravel in the net.

Many of the fishes swim into the crevices of the coral ~~and~~ where they should be looked for. Often burrowing eels come out headfirst for 3 or 6 inches exposed. If touched they ~~attract~~ ~~into~~ reenter into the gravelly bottom. These may be grabbed firmly and very quickly with the hand, then pulled out. Snake eels are not likely to bite you but morays should not be so handled.

The selection of an area to be worked must be carefully done, bearing in mind that the wind direction will carry ~~away~~ any floating fish over deep water where it may not be practical to recover them. It is best to have the wind blow the fish shoreward.

~~The~~ Rotenone may be successfully used in the ocean surf along the lithothamnium ridge at the edge of the reef. Here one finds a succession of surge channels, and out of which a current of water flows

This is derived from the breaking waves along the slightly elevated ridge. The powdered root in this case should be of the consistency of thick mud. Then 25 or 30 pounds of this is carried out on the lithothamnium ridge at low tide and thrown out to the edge of the reef in the foaming surf, the mud landing ~~just~~ in the back wash & carry it still further out, so that the next breakers will mix it fully into the innumerable crevices and pockets of the algae and corals. If surge channels with ~~deep~~ pools can be found, that is the best place to poison because the fish will settle into them and not be carried out to see in the surge channels.

Several men should constantly search a poisoned area for best recovery which usually will result in 75 to 100 species of fish. ~~Certain~~ Certain shrimp and cephalopods are killed by the action of rotenone as well as fishes.

Poisoning in 30 or 40 feet of water or deeper was done by Vernon Brock and R. E. S. Herald. Shallow diving gear was used of standard types

supplied by the navy. A cube of
Devil's root (powdered) was mixed
then poured into a 5 gallon
capacity desert water bag. This
was taken below and distributed
over the submerged coral head.
Then with dip nets the fishes
were recovered.

The lagoon fishes are distinctly
stratified as to species, although
in general the change is a gradual
one, as ^{shallow water} species disappear, additional
species occur at deeper levels
that were never taken over the
shallow ~~at~~ waters of the
reefs

July 27, 1947

On the evening of July 26 I loaned Larry Marquiss one of my harpoons. These were brought along for the purpose of getting a specimen of the Bikini Manta. Marquiss fixed the harpoon to a shaft, with tiller rope, thence to an oil drum and today they set forth for Enyu channel where we had seen big manta nearly every day last year, cruising around feeding by directing a current of water into their mouth by their cephalic lobes. Most of the manta seen there would have measured from 10 to 15 feet across the pectoral lobes.

St. Cox and Marquiss proceeded to the fishing grounds, spearing 3 manta, all of which got away, the last breaking the spearshaft. They returned at 2 P.M. and I loaned them the other spear. I did not go along and had planned to go with Ted Bayer to investigate some fish eggs and nests of Gobiodon.

Upon my return at 6:30 P.M. they were back with a 9' 8" wide Manta. Their struggle with it was a thrilling

account - but finally with boat hooks, two of my big shark hooks, the Manta, weighing 700 to 800 lb. was landed. It took 8 men to get it upon the deck.

When hoisted upon the chilton it was dropped on a pile of lumber. To get it off required the assistance of the 2nd and third ship divisions working for an hour. ~~It~~ They finally got the Manta aft on the fantail where ~~it~~ it was scrubbed down and numerous photographs

taken by the navy photographers. I can not but give the ship's company every praise for the aid they gave me while working on this huge specimen.

Jack Mann loaned me one of his 55 gal. drums. For three hours I butchered the Manta, reducing its flesh and throwing away the viscera, except spiral valve. About 11 P.M. it was clear to me that this manta would not go into a still drum so I they cut it into half with a ~~blade~~ saw and my knife. we cut its fins, back bone folding up the various parts

getting it tuck'd into the barrel with brute brute force. A carbony of 5 gallons of formalin were poured over it, water added. The next morning July '28, 2 more gal. formalin were added the whole carcass stirred around and poked and punched to get better circulation of the preservative.

This Manta was a female; it did not have an embryo though the uterus was somewhat distended.

The stomach contained a couple quarts of Crustaceans, a sample was taken by Ted Bayer. Dr. Cole examined the spiral valve for parasites. The gill rakers are developed into a beautiful strainer for sifting out the zooplankton. No fish remains were observed.

The extreme broadness of the head, from cephalic lobe to lobe, pointed pectoral tips, appear different from other figured Mantas.

The dorsal surface was ^{plain} blackish, the under sides white with

several large black blotches irregularly placed. One side of the cephalic lobes was white the other blackish.

We did not get a specimen of this species in 1946. The herpion was bent into an S shape but recovered.

Gobiodon titinus - nests quinquestrigatus

July 26. Ted Bayer showed me some lateral fish attached to a coral head that stem that he brought back from the outer reef of Bikini Island. I arranged to go with him July 27.

About $\frac{1}{2}$ to $\frac{2}{3}$ the way out to the $\frac{1}{2}$ mile wide reef occur small coral heads of the branching type, from 10 to 18 inches in diameter. These are of two kinds - Acropora digitifera (thick) & Acropora ? In both we found nests of the fishes seen by Bayer and from each head caught a pair of Gobiodon titinus, sometimes associated with the coral were Dasyllus and in one a pair of Coracanthus.

Now Gobiodon titinus must live in this coral head for a long time as the coral itself responds to the efforts of the fish, and a growth occurs of pinkish, purplish or brownish color with a raised rim around a slight depression, an inch long, in which the eggs are laid and the young Gobiodon develop. Eggs stages were found. Nests and a pair of fish were taken with each coral broken up. To get the fish out it was necessary to lift the coral out of the water

break it up and capture the fish as they fell out. Gobiodon remained among the coral branches until they were rendered into fragments.

The coral growths on this reef were about 25 to 50 feet apart in water about 2 feet deep. Two of the small heads - about 6 x 8 inches across contained no Gobiodon.

The nest, when examined under a microscope, shows that the eggs are attached to a gelatinous substratum by an adhesive short stalk. The head of the embryo is on the opposite end. Among the adhesive gelatinous substratum is growing a red - fine branching, fine filamentous alga, this alga does not grow beyond the confines limits of the nest but a few filaments extend outward among the eggs. These eggs are close-together but not crowded. The egg is oblong in shape. Underlying the gelatinous algal base and next to the coral is a greenish tinge. There appears to be some symbiotic relationship existing between the fish - alga and possibly not the coral as the area where the nest occurs has no living polyps.

July 31, 1947

Today I visited the reef on the west end of Bikini in search of nests of Gobiodon. Near the outer edge of this reef the coral growths appear to short for Gobiodon, and none were found after breaking up many on the spot. The lagoon was searched too and on the ocean side of the sand spit. Here the coral growths appear heavily damaged and are algal covered—a fine filamentous growth. Last year where great quantities of this dark blue coral grew luxuriantly—only a scanty growth now occurs, with only one or few spots alive on the side of the coral head, whereas last year the heads showed no dead areas.

In this area the water is 1 to 3 feet deep—one acropora, branching coral was found that swarmed with very young bright blue damselfish, only a few mm. in length. One Gobiodon was seen but escaped. No nests were seen. This shows that these reefs, although the most radio-active of any areas last year, have begun to recover sufficiently so that the small reef fishes have begun to recolonize them and a few coral heads indicate

recent spawning.

Spawning condition of Fishes

The milt was observed to flow freely
in the following species during July
and August

Echeneis macrurus
Abedus sordidus
Acanthurus triostegus
Katsuwonus pelamis

Kwajalein trip - Aug. 2-3, 4, 1947

at 8 AM we left by plane and flew from Bikini to Rongerik and thence around Rongerik. With the Plexiglass blisters open on each side we could look straight down. There were 8 scientists in the flight: Blinks and Whitaker of Stanford; Bonaddson and Brock, and myself; Gilfillan, Ewing, etc.

The white surf rolling in across the reef, deep-blue-green waters shading into the pale blue closer to shore and reef, with the reddish lithothamnium 'ridge' partly exposed. Then on the ocean side the long surge channels with dark green corals along their edges. The view showed a rich green and blue marine garden outlined by the white beach sands.

We left Rongerik and turned south to Kwajalein, which first appeared in the misty distance as a streak or spot of white down thru the broken pinacles of pearly white cumulus clouds. We followed the outline of this biggest of

all atolls for 80 miles, flying over 29 of the Bikini target ships of last year, still anchored there.

The Navy was on good behavior and showed us every available courtesy. Giving us cocktails & dinner party. Saturday night 7 of us gave 10 min. talks @ 600 or 700 people at the base, covering most subjects.

On Aug. 3 we went over to Carlos Island to participate in the dedication of a native church. After strolling around the island we entered the church, built by the natives out of driftwood and boxes, crates, left by the Jap. and American armed forces. It was nailed together, perhaps native lashing might last longer.

The service was in Marshallese. I liked the singing - both by men and women. There was a chorus of young folks, mostly girls - they sang in rather a high pitch voice - in octaves with little attempt at chords. The girls voices have a pleasant metallic sound when singing.

needless to write, I photographed profusely.

Shortly after the service, we attempted to be friendly and sat down on the church floor, just like all the other islands did, and they served us with some native food.

It was their custom to give away the church decorations - consisting of fans, bags, shell-belts, little boxes, etc. Some of the young girls tied leis around our necks. We were supposed to point out objects that pleased us and they or the owner of them gave it to us. I selected a fan - then took a photo of the lady too. Later the girl ~~that~~ gave me a little boy and I took his picture. Her name was Rose. The lady was Elsie - the native teacher.

The lei was made of sliced green leaves off a tree with little white blossoms tied into a prettily-decorative neck piece, very fragrant indeed and even today it is as fragrant (Aug. 4).

They served us, chicken, breadfruit

breadfruit and coconuts.

While we sat there, I gave
to each of the children one
~~sandwich~~ orange each from the
lunches sent along by the Navy.
This made the youngsters
very happy. The "teen-agers"
were friendly and soon began
to sing songs, American
songs, but the older men
and women did not join in
very much. All of the
children were well mannered,
quiet and clean. The entire
group were spotlessly clean,
in white clothes.

On the beaches were several
outrigger canoes. I photographed
these too.

That same afternoon Aug 3
we poisoned fish around the
Primo Eugene, stern out and
upside-down in the water.
It was giving off radiation.

Radioactivity

July 31, 1947

When the Bakerday bomb exploded July 25, 1946 a great cloud and rain of radioactive water fell on the reef from Bikini Island to Ameh. Two explorations of this area shows that the reef exposed at about low tidal level and along suffered heavy damage as the corals appear dead and in only a few places are they thriving as of last year. These dead corals, blocks of rock, are covered with a fine gray-brown filamentous algae.

Oil from the ships flowed over some of this reef but not all of it. At least it looks sick and is now just beginning to show signs of recovery.

The fishes that usually occur in such areas are back in their usual numbers, but there is little doubt the habitat in the shallow parts was disturbed.

One notable lack in that area are the Salarias bleusines (reef just west of Bikini) where last year they were more

numerous, about 3 miles west, however I could note no change in numbers.

March 23, 1947

To day I visited the coucal, the navy diving ship at Bikini, anchored over the submarine Apogon. My purpose was to see the new underwater television apparatus at work.

The lens & camera part was at a depth of 180 feet but had tipped over on the deck of the Apogon. Capt. Reed sent divers down to set it back up for me and then for ~~2~~ 2 1/4 hours I sat in a darkened room looking at the greenish screen, 6 to 8 inches in diameter as fishes continually swam by.

The images were very good; the color patterns of the fishes were distinct and clear cut so that I had no trouble recognizing 2 species of Lethrinus, Fistularia, Siganus, Caranx, Zanclus, and a Pomacentrid.

The apparatus was bulky but could be made more compact and usable. The underwater "camera" had a lens that was focused by a little electric motor.

The "camera" had a small angle of vision 4 x 4 feet at 15 feet distance but objects fully 30 or 40 feet away could be focused upon. Distant objects of 50 to 100 feet were not clear because of the general turbidity of the water.

Underwater television has great possibilities for study of aquatic animals in natural habitats — fields now will be opened for deep water studies never before dreamed of.

